



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE BACILLUS ABORTIVUS EQUINUS AS AN ETIOLOGICAL FACTOR IN INFECTIOUS ARTHRITIS OF COLTS *

EDWIN S. GOOD AND WALLACE V. SMITH

(From the Division of Animal Husbandry, Kentucky Agricultural Experiment Station, Lexington, Ky.)

The disease in question is known by a number of names, such as "joint evil," "joint ill," "rheumatism," "pyosepticemia of sucklings," "pasteurellosis neonatorum," "navel ill," "omphalophlebitis septica," "pyemic and septic joint disease of sucklings" and "septic arthritis."

Septic arthritis is an infectious disease of new-born animals, found most commonly in young colts. The disease is quite common in this and foreign countries and spreads rapidly in large stables, abounding in soiled bedding and where aseptic precautions are unheeded. In this territory, infectious arthritis is often found associated with colts that come alive in a stud of mares afflicted with infectious abortion.

It is claimed that infectious arthritis is due to an infection starting in the unhealed umbilicus at the time of or soon after birth, and by multiplication the micro-organisms causing the trouble reach the bloodstream, finding an especially suitable soil for their growth in the lungs, liver and on the synovial membranes and fluids of certain joints. Death ensues from the invasion of micro-organisms producing a general septicemia, or from inflammatory process of different internal organs and membranes of the joints of the body.

Foreign investigators have isolated a bacillus belonging to the hemorrhagic septicemia group, as well as a virulent strain of the colon bacillus.¹ Investigators in this country usually attribute the disease to a streptococcic invasion.²

Our investigations relative to the etiology of this disease among colts have been rather limited. In 1911, Dr. R. M. Bryan of Lexington sent to this laboratory some material which he had obtained by draining a large abscess formed at the hock of a young colt. A bacteriological examination revealed a streptococcus in large numbers.

* Received for publication, June 27, 1914.

1. Hutyra and Marek: Pathology and Therapeutics of Diseases of Domestic Animals, 1912, 1, p. 159.

2. Moore: The Pathology of Infectious Diseases of Animals, 1906, p. 25.

The second subject that we secured was a well-developed colt which had died from infectious arthritis. The hock, knee and ankle-joints were very much swollen and contained much pus; in fact, all joints of the body which we examined contained some pus. In plating this material we were surprised that a number of plates containing streak dilutions showed no growth. In only two or three plates streaked with pus from the joints were a few colonies obtained, but none proved to have been produced by pyogenic organisms. The few scattering colonies referred to above proved to have been produced by a bacillus resembling somewhat the bacillus abortivus equinus. This organism, however, died out so soon on the media used that we did not have the opportunity to make an extended study of it.

The third case was a colt dropped from a mare in which abortion had been produced experimentally the previous year by an intravenous injection of a small amount of the bacillus abortivus equinus.³ This mare was gotten safely in foal at the third service after aborting, and delivered a strong, healthy colt on April 27, 1914. We do not believe that this mare carried over any infection, due to the fact that the colt was very strong when dropped, also to the fact that during the four months previous to giving birth to the colt the blood-serum from this mare did not agglutinate the bacillus abortivus equinus, nor did it respond to the complement-fixation test. This colt was first seen to be ailing on May 13, 1913. The colt did not improve and showed signs of suffering from "joint ill." Dr. J. T. Shannon, who has had much experience with infectious arthritis in colts in this region, saw the animal and pronounced the symptoms typical of that disease. The colt was very much depressed and lay down most of the time. When helped to its feet it walked with difficulty and the movements of the legs produced apparent pain. It seldom nursed unaided. If permitted, it would drink large amounts of water. The pulse was accelerated and the temperature was high, registering 103.5 F. A persistent diarrhea soon set in. The eyes became involved, resulting in the loss of sight of one eye and the partial impairment of the sight of the other eye. At first, there was quite a noticeable swelling of the hocks, which later subsided to a considerable extent. There was, however, no improvement in the gait of the colt as the swelling subsided. The skin was covered with eruptions measuring about 1 cm. in diameter. On May 19 blood was drawn from the jugular vein; the serum did not give the agglutination and complement-fixation tests with antigen made from the bacillus abortivus equinus. The colt died during the night of May 20. On autopsy large areas of the lungs were found to be hepatized. The lymphatic system was congested. The spleen was enlarged and covered with many petechiae. The heart appeared normal. The kidneys were enlarged and somewhat friable. The outer covering of the small intestines contained many blood-spots, ranging in size from a pinhead to 1 cm. in diameter, as is sometimes noted on the small intestines of a hog suffering from cholera. Areas of the heart, lungs, spleen, liver and of the kidneys were seared, and streak dilutions were made from the blood of these organs as per the usual technic. After twenty-four hours' incubation, these streak dilutions showed a growth resembling somewhat that of the bacillus abortivus equinus. That the colon bacillus was also present was evidenced by the odor. After making several plate dilutions, a bacillus having the morphological and the cultural characteristics of the bacillus abortivus equinus was obtained in pure culture. The skin from the hocks, knees and ankles was removed, the places laid bare were washed with a 5 per cent. solution of carbolic acid and the joints were

3. *Jour. Infect. Dis.*, 1913, 12, p. 53.

opened with sterile knives. The synovial fluid of these joints was slightly increased in amount and of a slightly darker amber color than usual—not so much, however, as to denote marked pathological changes. The results of plate cultures made from the fluid contents of these joints showed that a bacillus responding to the morphological and fermentation tests of the bacillus abortivus equinus was present in abundance in this fluid and was not associated with any other organism. An agglutination fluid was made by washing the growth from agar slants inoculated with material from the colt's knee. Bacillus abortivus equinus immune sheep-serum, which completely agglutinated our standard fluid in a dilution of 1 to 1,250, completely agglutinated the fluid made from the organism derived from the colt in a dilution of 1 to 1,250. Bacillus abortivus equinus immune horse-serum, which completely agglutinated our standard fluid in a dilution of 1 to 1,000, completely agglutinated the fluid noted above in a dilution of 1 to 1,250. By using .01, .02, .03, .04, .05, .06, .07 and .08 c.c. of an antigen made from slants streaked with the organism obtained from the colt, with the bacillus abortivus equinus immune sheep-serum whose titer was .02, and with the bacillus abortivus equinus immune horse-serum whose titer was .02, the complement was completely fixed, with no absorption in tubes containing five times the amounts of antigen in the first four tubes above.

From all the above tests, we feel sure that the organism isolated from this colt suffering from infectious arthritis is the same as the organism causing infectious abortion in mares. We are of the opinion that the colt was infected by way of the umbilicus. That the blood-serum of this colt did not respond to the agglutination and complement-fixation tests, as is noted of mares afflicted with infectious abortion, was due, no doubt, to the shortness of the infection, thus not allowing sufficient time for the development of immune bodies. Our observations show that immune bodies in mares do not develop for from ten to fourteen days after subcutaneous and intravenous injections of the bacillus abortivus equinus. A mare had died the year before, in the stall in which this colt was dropped, from a chronic diarrhea due to a heavy feed of this bacillus. The stall was cleaned and thoroughly sprayed with a coal-tar disinfectant. However, as this stall has a dirt floor, it is evident that disinfection would be difficult.

At the present time it is impossible to say as to what rôle the bacillus abortivus equinus plays in the disease of infectious arthritis of colts, but that it is capable of producing this disease, as are the other germs noted by investigators, is evidenced in this instance.